

Amendments to the Claims:

The following Listing of Claims will replace all prior versions, and listings, of claims in the application:

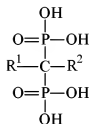
Listing of Claims

1-45. (Canceled)

46. (Withdrawn – currently amended) A method of treating a hard surface, the method comprising:

etching the hard surface with a composition comprising a compound of the following

Formula I:



(I)

or a salt thereof, wherein:

R^1 is an aliphatic, aromatic, aralkyl, or alkaryl group~~organic moiety~~ that includes a polymerizable group; and

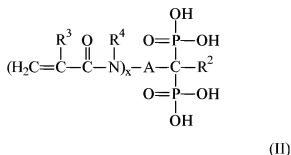
R^2 is H, OR, SR, N(R)_2 , or an organic group that can optionally join with R^1 to form a carbon-carbon double bond with the carbon between the two phosphorus atoms, wherein the organic group optionally includes a polymerizable group, and further wherein each R is independently hydrogen or an organic group optionally including a polymerizable group;

with the proviso that the hard surface is not pretreated.

47. (Withdrawn – currently amended) A method of treating a hard surface, the method comprising:

etching the hard surface with a composition comprising a compound of the following

Formula II:



or a salt thereof, wherein:

 $x = 1-3;$

R^2 is H, OH, an alkyl group, an aryl group, an alkoxy group, an aryloxy group, or $-A-(N(R^4)-C(O)-C(R^3)=CH_2)_x$;

each R³ is independently H or CH₃;

each R⁴ is independently H, an alkyl group, or can be joined to A forming a cyclic group; and

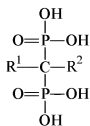
A is a bond or a straight chain or branched aliphatic group ~~organic moiety~~;
with the proviso that the hard surface is not pretreated.

48. (withdrawn) The method of claim 47 wherein the composition etches and primes the hard surface.

49. (withdrawn) The method of claim 48 wherein the hard surface is a hard tissue.

50. (Withdrawn – currently amended) A method of treating a tooth surface, the method comprising:

etching the tooth surface with a composition comprising a compound of the following Formula I:



(I)

or a salt thereof, wherein:

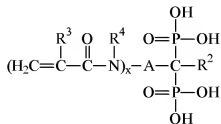
R^1 is an aliphatic, aromatic, aralkyl, or alkaryl group~~organic moiety~~ that includes a polymerizable group; and

R^2 is H, OR, SR, N(R)_2 , or an organic group that can optionally join with R^1 to form a carbon-carbon double bond with the carbon between the two phosphorus atoms, wherein the organic group optionally includes a polymerizable group, and further wherein each R is independently hydrogen or an organic group optionally including a polymerizable group;

with the proviso that the tooth surface is not pretreated with phosphoric acid.

51. (Withdrawn – currently amended) A method of treating a tooth surface, the method comprising:

etching the tooth surface with a composition comprising a compound of the following Formula II:



(II)

or a salt thereof, wherein:

$x = 1-3$;

R^2 is H, OH, an alkyl group, an aryl group, an alkoxy group, an aryloxy group, or $-\text{A}-(\text{N(R}^4)-\text{C(O)-C(R}^3)=\text{CH}_2)_x$;

each R³ is independently H or CH₃;

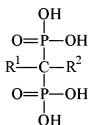
each R⁴ is independently H, an alkyl group, or can be joined to A forming a cyclic organic group; and

A is a bond or a straight chain or branched aliphatic group ~~organic moiety~~;
with the proviso that the tooth surface is not pretreated with phosphoric acid.

52. (withdrawn) The method of claim 51 wherein the composition further comprises at least one polymerizable component different from the compound of Formula II.
53. (withdrawn) The method of claim 52 wherein the composition functions as a self-etching primer thereby etching and priming the tooth surface simultaneously.
54. (withdrawn) The method of claim 52 wherein the composition functions as a self-etching adhesive to promote adherence of a dental material to the tooth surface.
55. (withdrawn) The method of claim 54 wherein the dental material is selected from the group consisting of a composite, a filling, a sealant, an inlay, an onlay, a crown, and a bridge.
56. (withdrawn) The method of claim 52 wherein the composition functions to promote the adherence of an orthodontic adhesive to the tooth surface, wherein the orthodontic adhesive functions to adhere an orthodontic appliance to the tooth surface.
57. (withdrawn) The method of claim 56 wherein the orthodontic appliance is selected from the group consisting of a bracket, a buccal tube, a band, a cleat, a button, a lingual retainer, and a bite blocker.
58. (withdrawn) The method of claim 51 further comprising a step of priming the tooth surface.
59. (withdrawn) The method of claim 51 further comprising a step of applying a dental adhesive to the tooth surface.

60. (withdrawn) The method of claim 51 wherein the tooth surface comprises enamel.
61. (withdrawn) The method of claim 51 wherein the tooth surface comprises dentin.
62. (Withdrawn – currently amended) A method of adhering an orthodontic appliance to a tooth surface, the method comprising:
- etching the tooth surface with a composition comprising a compound of the following

Formula I:



(I)

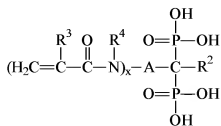
or a salt thereof, wherein:

R^1 is an aliphatic, aromatic, aralkyl, or alkaryl group~~organic moiety~~ that includes a polymerizable group; and

R^2 is H, OR, SR, $\text{N}(\text{R})_2$, or an organic group that can optionally join with R^1 to form a carbon-carbon double bond with the carbon between the two phosphorus atoms, wherein the organic group optionally includes a polymerizable group, and further wherein each R is independently hydrogen or an organic group optionally including a polymerizable group; and

adhering an orthodontic appliance to the tooth surface.

63. (Withdrawn – currently amended) A method of adhering an orthodontic appliance to a tooth surface, the method comprising:
- etching the tooth surface with a composition comprising a compound of the following
- Formula II:



(II)

or a salt thereof, wherein:

$x = 1-3$;

R^2 is H, OH, an alkyl group, an aryl group, an alkoxy group, an aryloxy group, or $-\text{A}-(\text{N}(\text{R}^4)-\text{C}(\text{O})-\text{C}(\text{R}^3)=\text{CH}_2)_x$;

each R^3 is independently H or CH_3 ;

each R^4 is independently H, an alkyl group, or can be joined to A forming a cyclic organic group; and

A is a bond or a straight chain or branched aliphatic group ~~organic moiety~~; and adhering an orthodontic appliance to the tooth surface.

64. (withdrawn) The method of claim 63 further comprising adhering an orthodontic adhesive to the tooth surface.

65. (withdrawn) The method of claim 64 wherein the orthodontic adhesive has been pre-applied to the orthodontic appliance before adhering to the tooth surface.

66. (withdrawn) The method of claim 63 wherein the orthodontic appliance is selected from the group consisting of a bracket, a buccal tube, a band, a cleat, a button, a lingual retainer, and a bite blocker.

67. (withdrawn) The method of claim 63 further comprising a step of priming the tooth surface prior to adhering an orthodontic appliance to the tooth surface.

68. (withdrawn) The method of claim 67 wherein the composition further comprises at least one polymerizable component different from the compound of Formula II and wherein the steps

of etching and priming are done simultaneously with the composition functioning as a self-etching primer composition.

69. (withdrawn) The method of claim 68 further comprising adhering an orthodontic adhesive to the tooth surface.

70. (withdrawn) The method of claim 69 wherein the orthodontic adhesive has been pre-applied to the orthodontic appliance before adhering to the tooth surface.

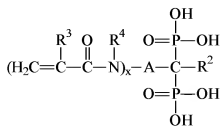
71. (withdrawn) The method of claim 63 further comprising a step of applying a dental adhesive to the tooth surface prior to adhering an orthodontic appliance to the tooth surface.

72. (withdrawn) The method of claim 71 wherein the composition further comprises at least one polymerizable component different from the compound of Formula II and wherein the steps of etching and applying a dental adhesive are done simultaneously with the composition acting as a self-etching adhesive composition.

73. (withdrawn) The method of claim 72 further comprising adhering an orthodontic adhesive to the tooth surface.

74. (withdrawn) The method of claim 73 wherein the orthodontic adhesive has been pre-applied to the orthodontic appliance before adhering to the tooth surface.

75. (New) An etching composition comprising:
an ethylenically unsaturated polymerizable component; and
a compound of Formula II, which is different from the polymerizable component,
wherein Formula II is:



(II)

or a salt thereof, wherein:

$x = 1-3$;

R^2 is H, OH, an alkyl group, an aryl group, an alkoxy group, an aryloxy group, or $-\text{A}-(\text{N}(\text{R}^4)-\text{C}(\text{O})-\text{C}(\text{R}^3)=\text{CH}_2)_x$;

each R^3 is independently H or CH_3 ;

each R^4 is independently an alkyl group having 4 to 18 carbon atoms, or can be joined to A forming a cyclic organic group; and

A is an aliphatic, aromatic, aralkyl, or alkaryl group having 6 to 20 carbon atoms; wherein the compound of Formula II is present in an amount sufficient to etch a hard surface, thereby forming an etchant.

76. (New) The composition of claim 75 wherein the composition is a self-etching primer.
77. (New) The composition of claim 75 wherein the composition is a self-etching adhesive.
78. (New) The composition of claim 75 wherein each R^4 is independently a (C8-C18) alkyl group.
79. (New) The composition of claim 75 wherein R^2 is a (C1-C4)alkoxy group.
80. (New) The composition of claim 75 wherein R^2 is OH.
81. (New) The composition of claim 75 wherein A is $(\text{CH}_2)_n$ wherein $n = 6-20$.
82. (New) The composition of claim 81 wherein $n = 10-20$.

83. (New) The composition of claim 75 wherein the compound of Formula II is present in an amount of at least about 1 wt-%, based on the total weight of the composition.

84. (New) The composition of claim 75 wherein the polymerizable component is selected from the group consisting of 2-hydroxyethyl methacrylate (HEMA), polyethyleneglycol dimethacrylate (PEGDMA), copolymer of acrylic acid:itaconic acid with pendent methacrylate (AA:ITA:IEM), 2,2-bis[4-(2-hydroxy-3-methacryloxypropoxy)phenyl]propane (bisGMA), urethane dimethacrylate (UDMA), and glycerol dimethacrylate (GDMA), and combinations thereof.

85. (New) The composition of claim 75 further comprising an adhesive component.

86. (New) The composition of claim 75 further comprising a primer component.

87. (New) The composition of claim 75 further comprising a filler.

88. (New) The composition of claim 75 further comprising water or a nonaqueous solvent.

89. (New) The composition of claim 75 further comprising a photoinitiator.

90. (New) The composition of claim 75 further comprising an oxidizing agent and a reducing agent.

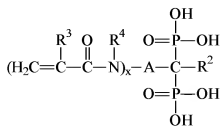
91. (New) The composition of claim 75 wherein the hard surface is dentin or enamel.

92. (New) A composition comprising:

an ethylenically unsaturated polymerizable component; and

a compound of Formula II, which is different from the polymerizable component,

wherein Formula II is:



(II)

or a salt thereof, wherein:

$x = 1-3$;

R^2 is H, OH, an alkyl group, an aryl group, an alkoxy group, an aryloxy group, or $-\text{A}-(\text{N}(\text{R}^4)-\text{C}(\text{O})-\text{C}(\text{R}^3)=\text{CH}_2)_x$;

each R^3 is independently H or CH_3 ;

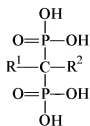
each R^4 is independently an alkyl group having 4 to 18 carbon atoms, or can be joined to A forming a cyclic organic group; and

A is a bond or an aliphatic, aromatic, aralkyl, or alkaryl group having 6 to 20 carbon atoms;

wherein the compound of Formula II is present in an amount of at least about 1 wt-%, based on the total weight of the composition.

93. (New) The composition of claim 92 wherein the composition is an etchant for a hard surface.
94. (New) The composition of claim 92 wherein the composition is a self-etching primer.
95. (New) The composition of claim 92 wherein the composition is a self-etching adhesive.
96. (New) The composition of claim 92 wherein each R^4 is independently a (C8-C18) alkyl group.
97. (New) The composition of claim 92 wherein R^2 is a (C1-C4)alkoxy group.
98. (New) The composition of claim 92 wherein R^2 is OH.

99. (New) The composition of claim 92 wherein A is $(CH_2)_n$ wherein $n = 6-20$.
100. (New) The composition of claim 99 wherein $n = 10-20$.
101. (New) The composition of claim 92 wherein the compound of Formula II is present in an amount of at least about 5 wt-%, based on the total weight of the composition.
102. (New) The composition of claim 92 wherein the polymerizable component is selected from the group consisting of HEMA, PEGDMA, AA:ITA:IEM, bisGMA, UDMA, GDMA, and combinations thereof.
103. (New) The composition of claim 92 for bonding a dental restorative to a hard surface.
104. (New) The composition of claim 103 wherein the hard surface is dentin or enamel.
105. (New) The composition of claim 92 further comprising an adhesive component.
106. (New) The composition of claim 92 further comprising a filler.
107. (New) The composition of claim 92 further comprising water or a nonaqueous solvent.
108. (New) An etching composition comprising:
An ethylenically unsaturated polymerizable component; and
a compound of Formula I, which is different from the polymerizable component, wherein
Formula I is:



(I)

or a salt thereof, wherein:

R^1 includes a cyclic group and a polymerizable group, or is an aliphatic, aromatic, aralkyl, or alkaryl group substituted with an element other than carbon and hydrogen and including an ethylenically unsaturated polymerizable group; and

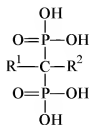
R^2 is H, OR, SR, $\text{N}(\text{R})_2$, or an organic group that can optionally join with R^1 to form a carbon-carbon double bond with the carbon between the two phosphorus atoms, wherein the organic group optionally includes an ethylenically unsaturated polymerizable group, and further wherein each R is independently hydrogen or an organic group optionally including an ethylenically unsaturated polymerizable group;

wherein the compound of Formula I is present in an amount sufficient to etch a hard surface, thereby forming an etchant.

109. (New) An etching composition comprising:

An ethylenically unsaturated polymerizable component; and

a compound of Formula I, which is different from the polymerizable component, wherein Formula I is:



(I)

or a salt thereof, wherein:

R^1 is an aliphatic, aromatic, aralkyl, or alkaryl group that includes an ethylenically unsaturated polymerizable group; and

R^2 is OR, SR, N(R)₂, or an organic group that can optionally join with R^1 to form a carbon-carbon double bond with the carbon between the two phosphorus atoms, wherein the organic group optionally includes an ethylenically unsaturated polymerizable group, and further wherein each R is independently an organic group optionally including an ethylenically unsaturated polymerizable group;

wherein the compound of Formula I is present in an amount sufficient to etch a hard surface, thereby forming an etchant.